YASKAWA

KNOWLEDGEBASE ARTICLE

SICK Flexi Soft FX3-GEPR (EFI-pro) to YRC1000 CIP Safety Setup With EtherNet/IP Standard I/O

Configuration Guide

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DOCUMENT CONTROL

REVISION HISTORY

DATE	VERSION	DOCUMENT CHANGES	BY
2024-07-23	1.00	Initial release	M. Allen
2026-11-09	1.01	Documented 10 byte non-safety connection and document template reformat	S. Smith

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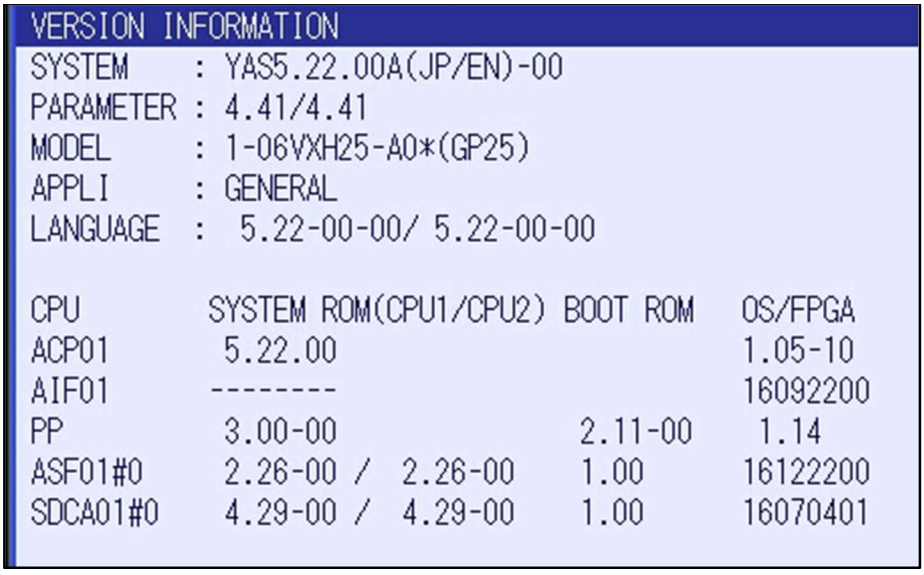
OVERVIEW

This document shows how to configure a Yaskawa YRC-1000 controller to a Sick FlexiSoft Safety PLC with a GEPR EFI-Pro Module for Ethernet/IP Standard and CIP Safety Connections.

SYSTEM DETAILS

This setup was achieved with the following hardware and software versions.

- YRC-1000 controller software for this test was YAS5.22.00-00 however we expect prior revisions to be identical in behavior.



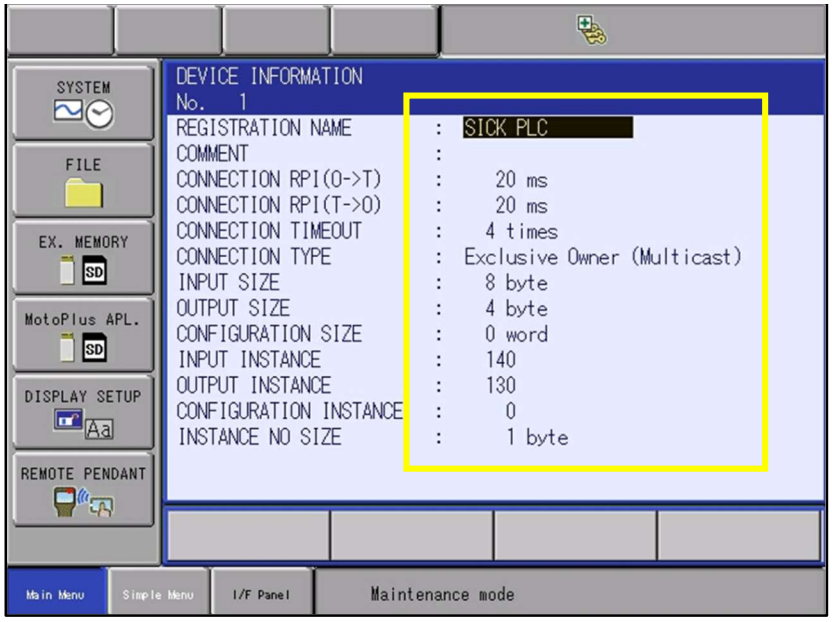
- FX3-CPU0 with version 1.17.12339/4.xx, Part Number: 1043783
- FX3-GEPR with version 1.17.12339/1.xx, Part Number: 1069070
- Sick Safety Designer version 2024.02

ROBOT SETUP

- Make sure to complete the EIP standard and safety setup for the YRC 1000 controller. This should have already been completed prior to robot delivery.
- Boot into Maintenance mode.
- Log into Safety User
- Select SYSTEM -> SETUP -> OPTION FUNCTION -> ETHERNET/IP -> SCANNER.

STANDARD I/O - 4 BYTE I/O CONNECTION

- Add new device. Change the name, RPI, input size, output size match as per the below screenshot.

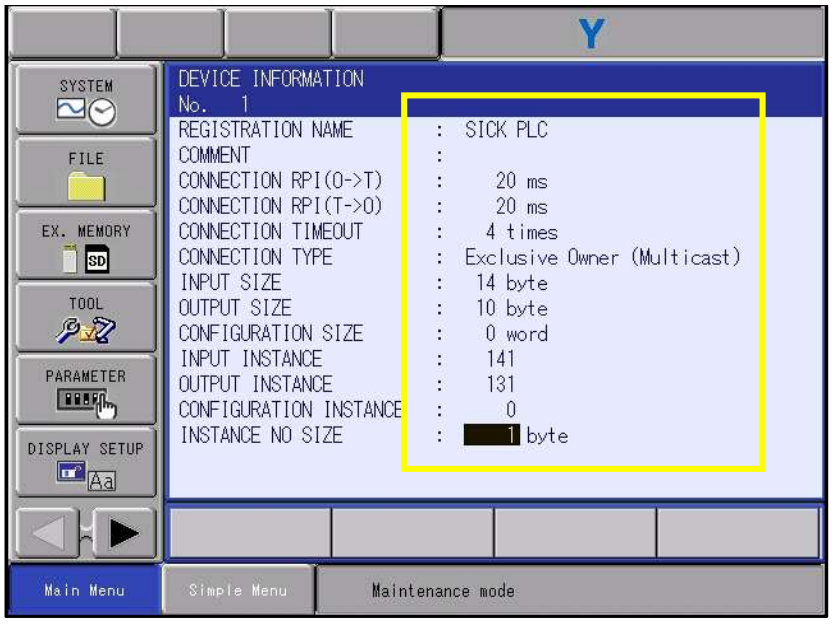


NOTE

The input size needs to be 8 bytes, the SICK module has a 4 byte output header to the robot before the actual data is mapped. This is important! If you do not set this to 8 it will not connect.

STANDARD I/O - 10 BYTE I/O CONNECTION

- Add new device. Change the name, RPI, input size, output size match as per the below screenshot.

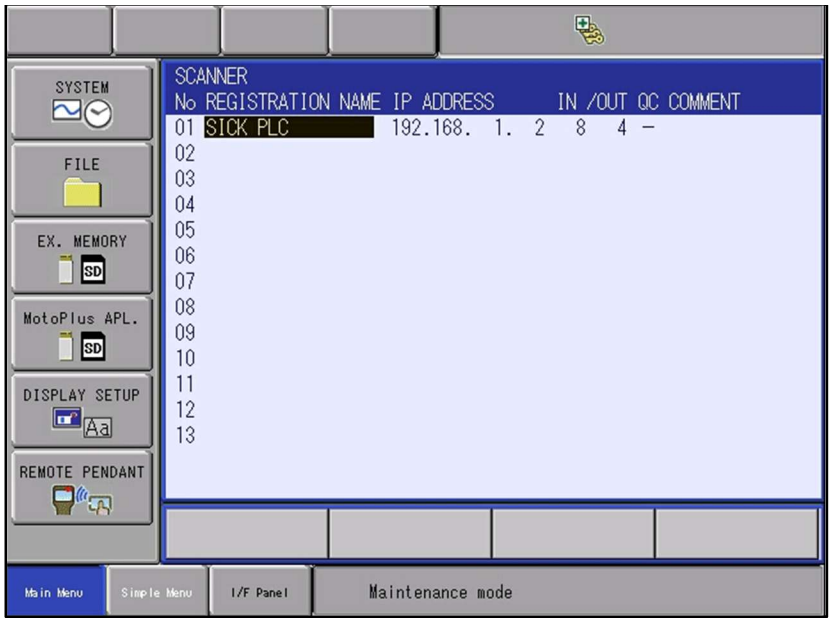


NOTE

The input size needs to be 14 bytes, the SICK module has a 4 byte output header to the robot before the actual data is mapped. This is important! If you do not set this to 14 it will not connect.

SCAN LIST

- Add the device to the scan list.
- From the ETHERNET/IP main screen, select SCANNER
- Make sure to set the IP address to the same as the one set in Safety Designer software environment.
- The number of input and output bytes should match the connection size chosen. Either 8/4 or 14/10.



ETHERNET/IP SAFETY SETUP

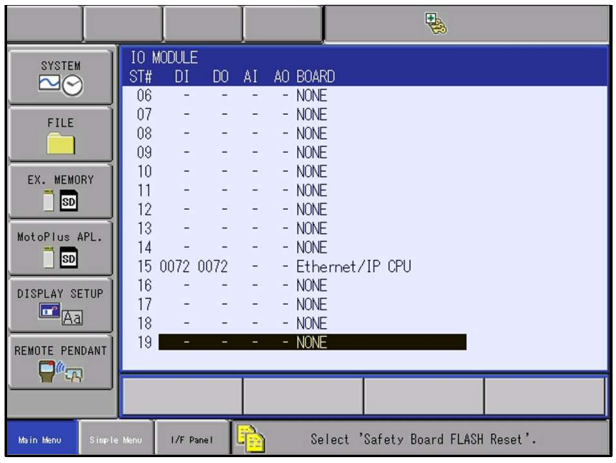
- From the ETHERNET/IP main screen…
- Ensure Ethernet/IP Safety is set to USED. This is a purchased option.
- Safety IO Size is set to 8 Bytes.
- VIRTUAL COMM is set to SAFETY.

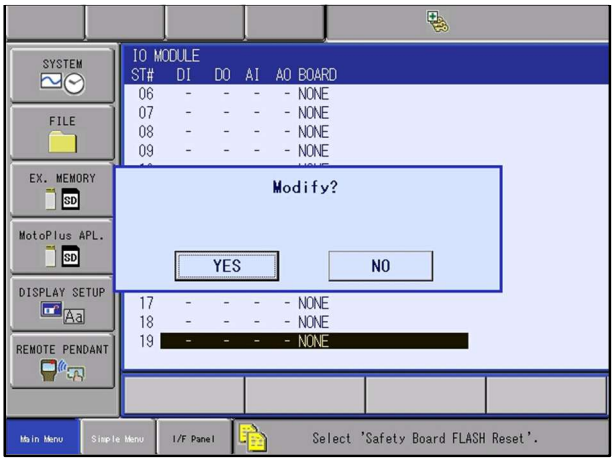


NOTE

VIRTUAL COMM mode = SAFETY indicates the connection is active.
VIRTUAL COMM mode = VIRTUAL, the robot will mute its alarm should the connection not establish

- Press Enter on the ETHERNET/IP main screen to start allocating the standard I/O ethernet bits.
- Ensure Ethernet/IP CPU is on ST#15. Press enter again and modify.



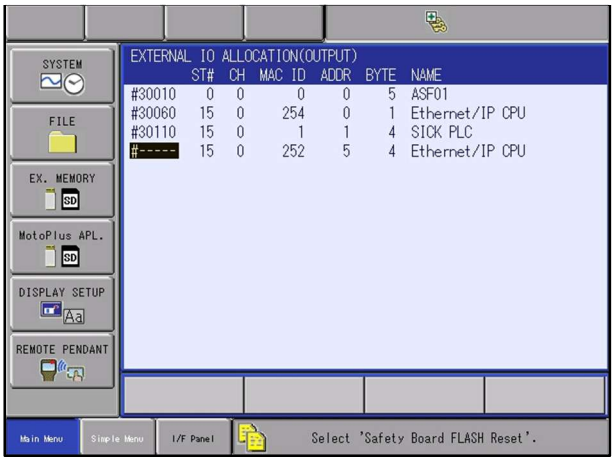


EXTERNAL I/O ALLOCATION

The Ethernet/IP standard (un-safe) I/O needs to be allocated into an input/output range of the robot controller I/O system. There are two methods of doing this. AUTO allocation and MANUAL allocation. Generally, we believe MANUAL allocation will be required so that the selected I/O does not interfere with other Yaskawa default ranges. If there is any uncertainty, Yaskawa tech-support can provide further assistance. The example imagery below shows manual allocation. Your I/O allocation range will likely differ.



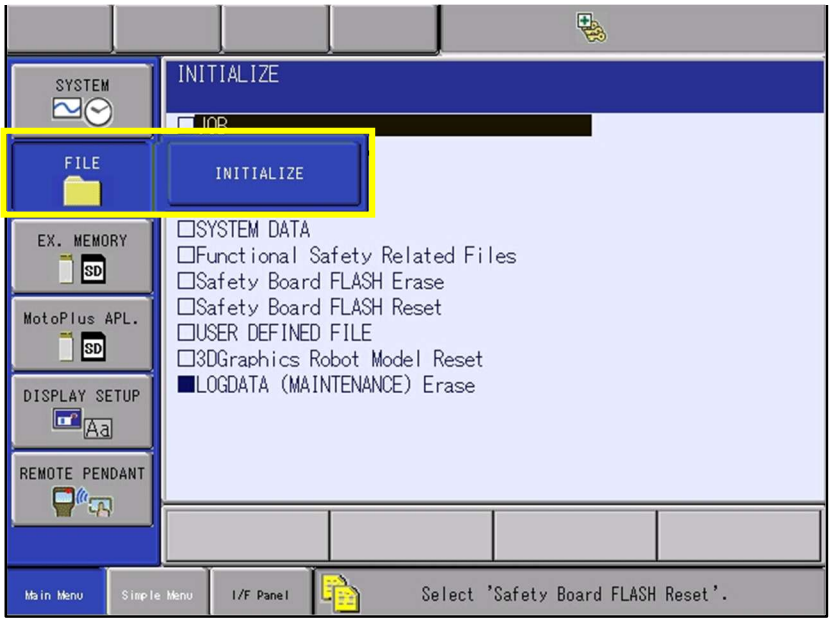


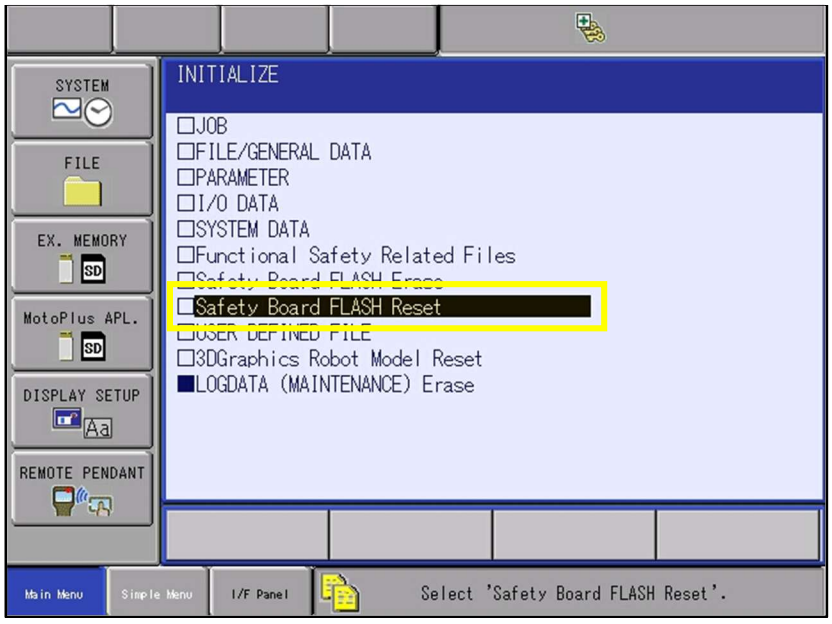


SAFETY BOARD FLASH RESET

As is the case after any major system change, the safety board needs to also pull in those change points.

- Select the FILE menu.
- Select INITIALIZE sub-menu.
- Scroll down to SAFETY BOARD FLASH RESET and press SELECT.
- The reset procedure will take approximately 2 minutes. During this time, the cursor will be locked.
- Once completed, reboot into normal online mode.

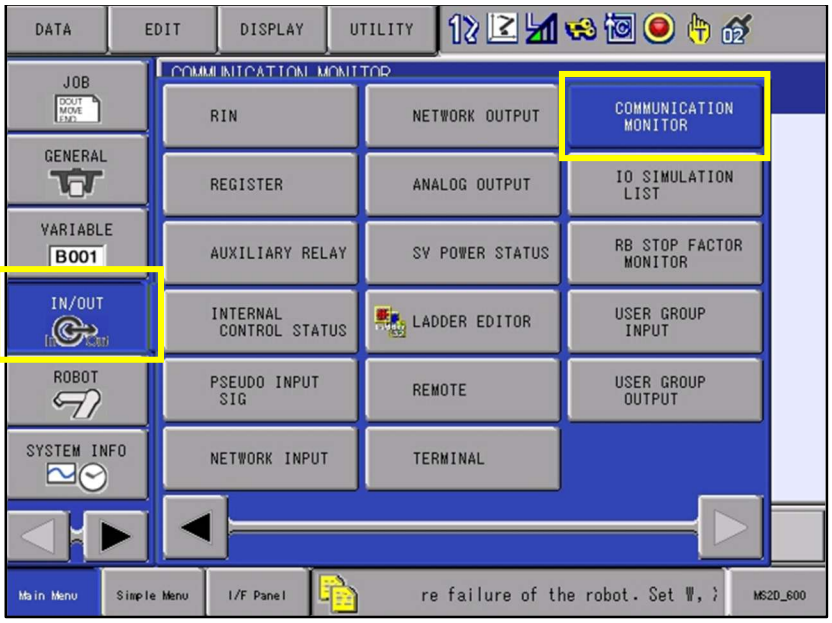




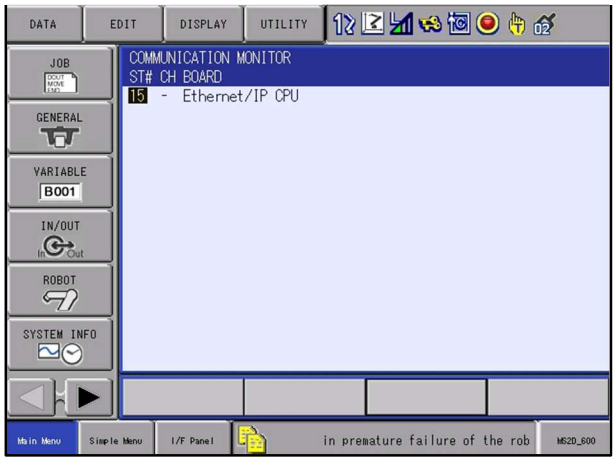
COMMUNICATION MONITOR

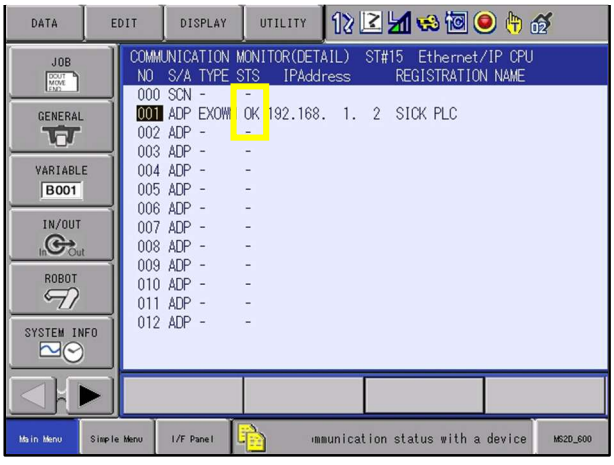
Communication to an ethernet/IP device can be verified by using the communication monitor menu.

- Select the INPUT/OUTPUT menu
- Select the COMMUNICATION MONITOR sub-menu



- Select the Ethernet/IP board for monitoring
- Verify that the connection has OK for the status.
- If it has NG, press enter and see what the connection issue is.
- Check for target -> originator size incorrect, IP address incorrect, In/Out instances backwards, etc…

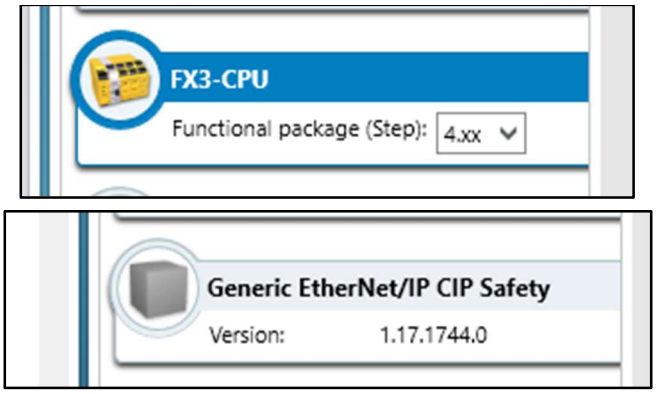




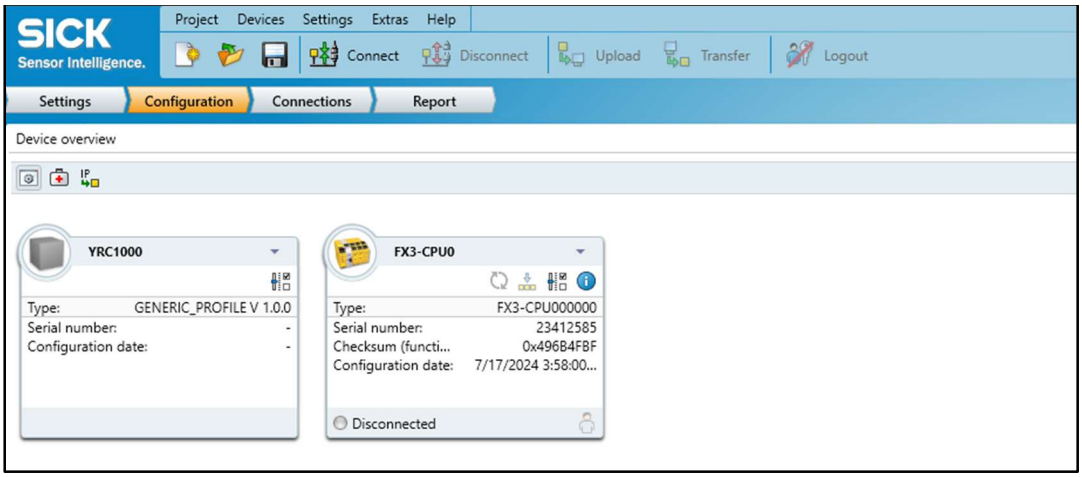
SICK SAFETY DESIGNER SETUP

ADD DEVICES TO SAFETY DESIGNER

- Create a new safety designer project.
- Add a FX3-CPU and a “Generic Ethernet/IP Cip Safety” device to the device overview by dragging them over to the device overview.



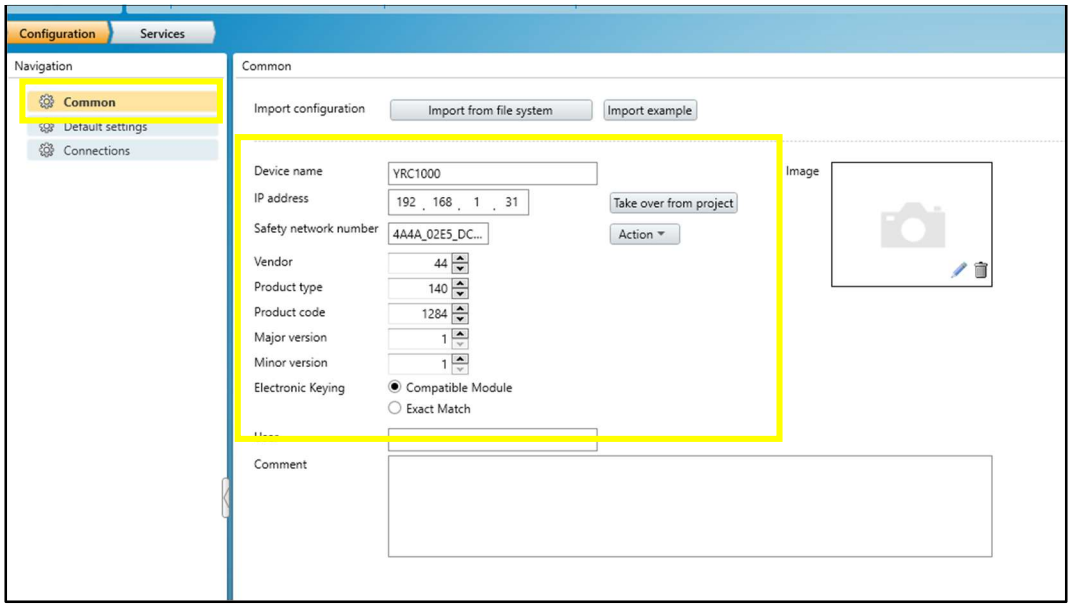
- The overview should look like this once added.



EDIT GENERIC CIP SAFETY DEVICE (YRC1000)

- Select the newly added generic device
- Under CONFIGURATION -> COMMON you will need to set the common settings of the Generic CIP Safety Device (YRC1000 in this case).

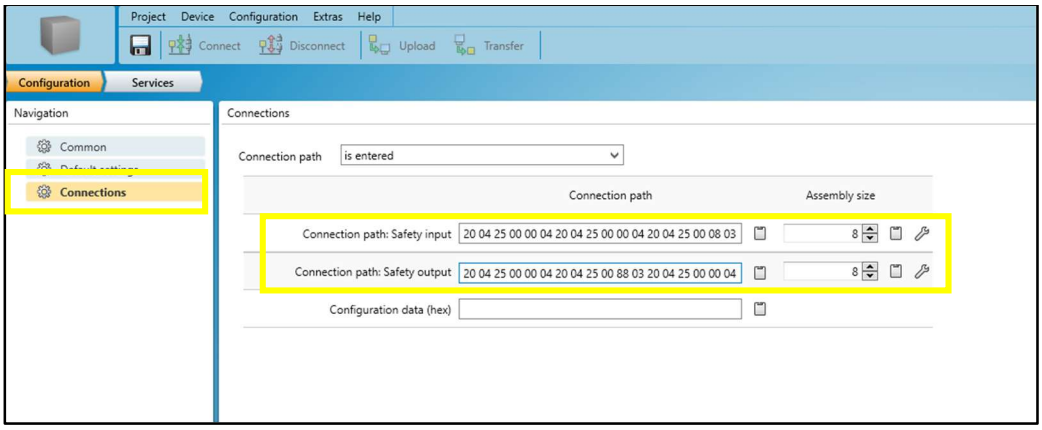
SETTING	VALUE
Device Name	Can put anything you want. (YRC1000 was used for this document.)
IP Address	IP Address of the robot, (192.168.1.31 was used for this document)
Safety Network Number	Press Action-> Take over from project
Vendor	44
Product Type	140
Product Code	1284
Major Version	1
Minor Version	1
Electronic Keying	Compatible Module



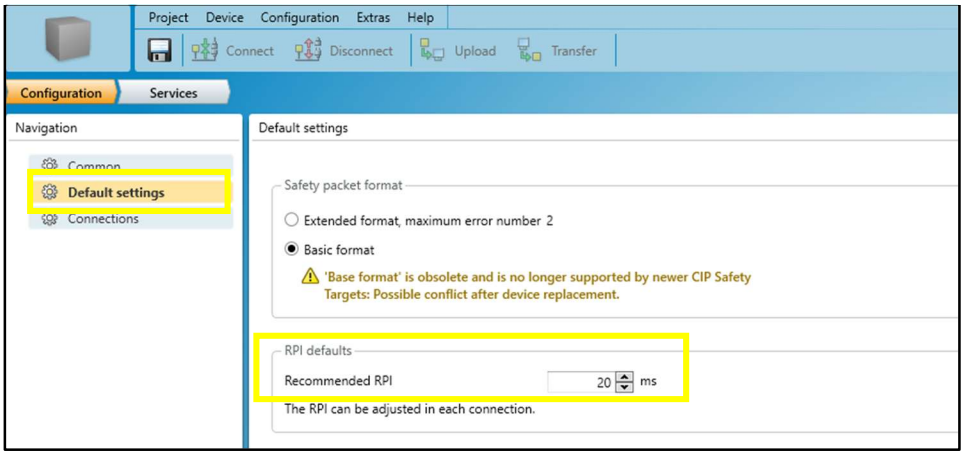
- Select CONFIGURATION -> CONNECTIONS.

  Paste “20 04 25 00 00 04 20 04 25 00 00 04 20 04 25 00 08 03“ into the connection path for safety inputs, set assembly size to 8. Do not include the quotation marks.

  Paste “20 04 25 00 00 04 20 04 25 00 88 03 20 04 25 00 00 04” into the connection path for safety outputs, set assembly size to 8. Do not include the quotation marks.



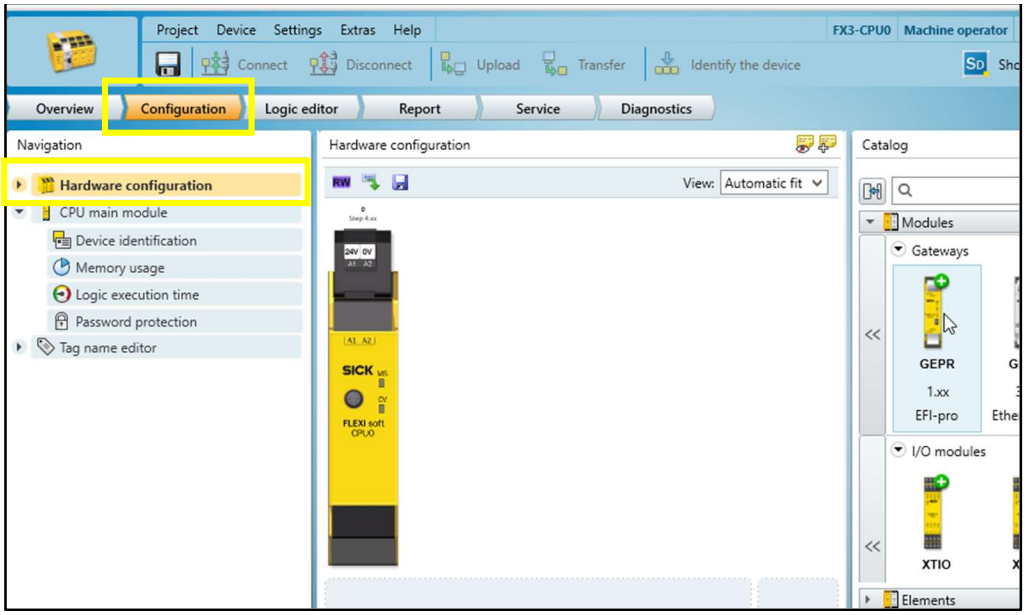
- Select CONFIGURATION -> DEFAULT SETTINGS. Make sure the safety packet format is set to Basic format and the RPI is set to 20 ms.



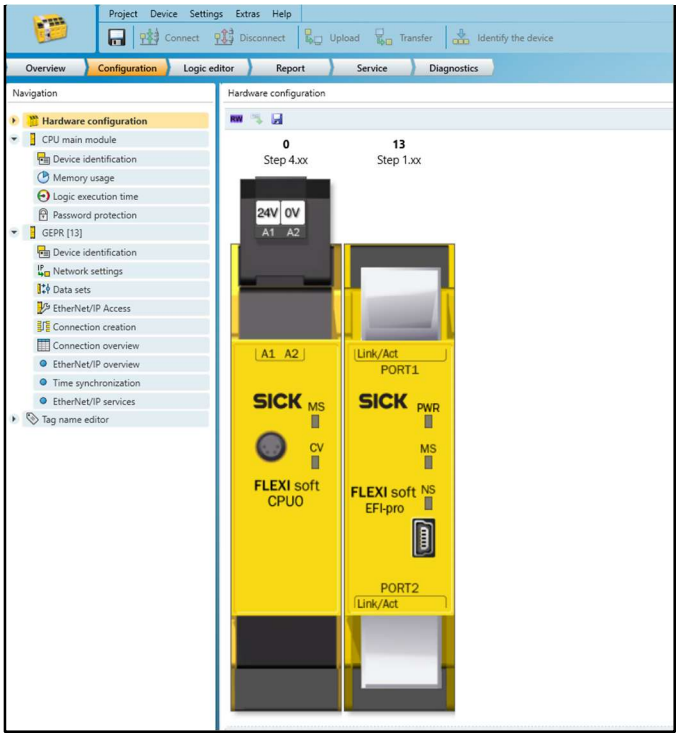
- You can close the window.

EDIT FX3 CPU DEVICE

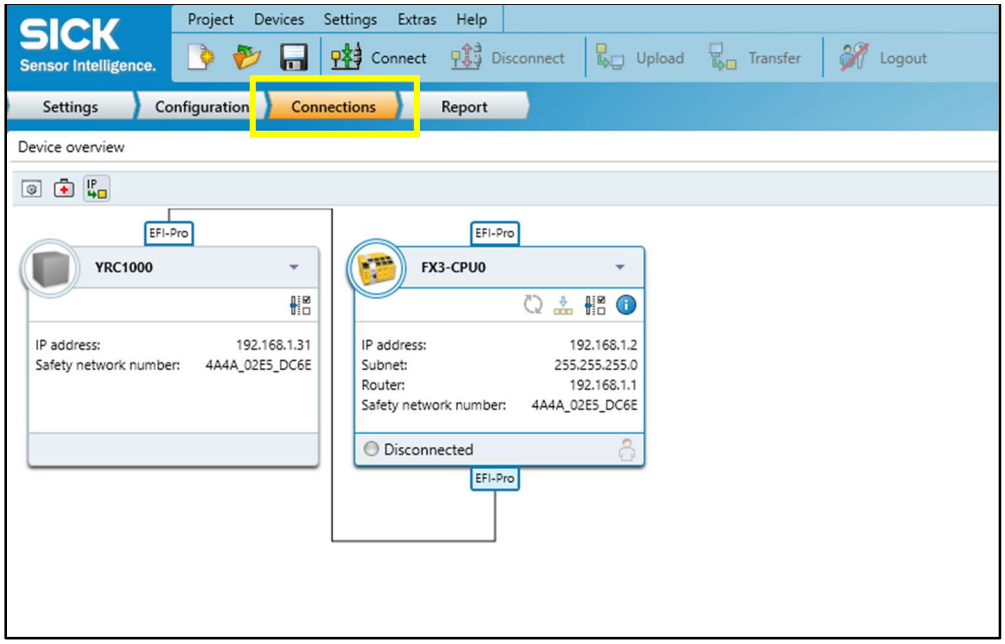
- Select the FX3 module and go to CONFIGURATION -> HARDWARE CONFIGURATION
- Drag a GEPR[13] from the Modules list in the catalog over beside the FX3



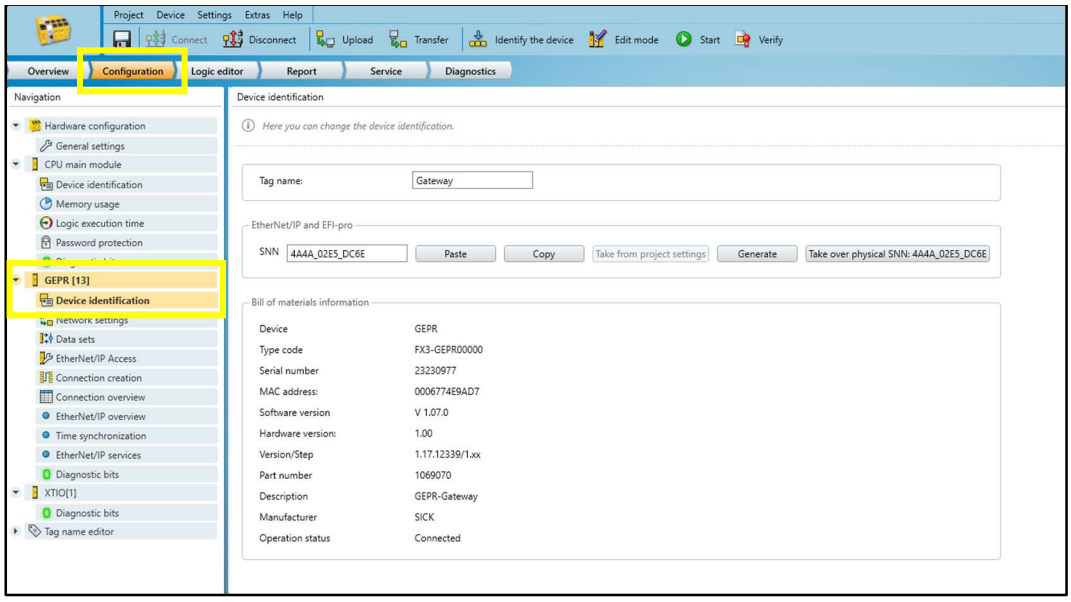
- Your project's hardware configuration should look like this once you have dragged it over.



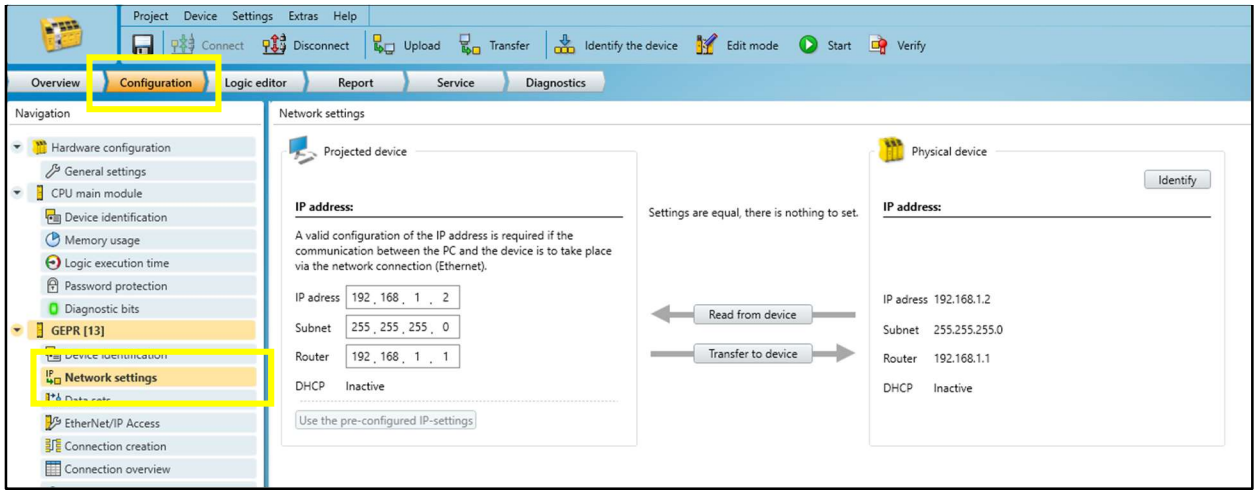
- Temporarily return to the main window.
- Select the CONNECTIONS tab
- You will be able to draw a connection between the FX3 FlexiSoft CPU and the generic CIP Safety Module. It should look like the below image once the connection is drawn.



- Select CONFIGURATION -> GEPR[13] -> DEVICE IDENTIFICATION
- Make sure the SNN is set to the project SNN, if not, click take over physical SNN. The new SNN should populate.

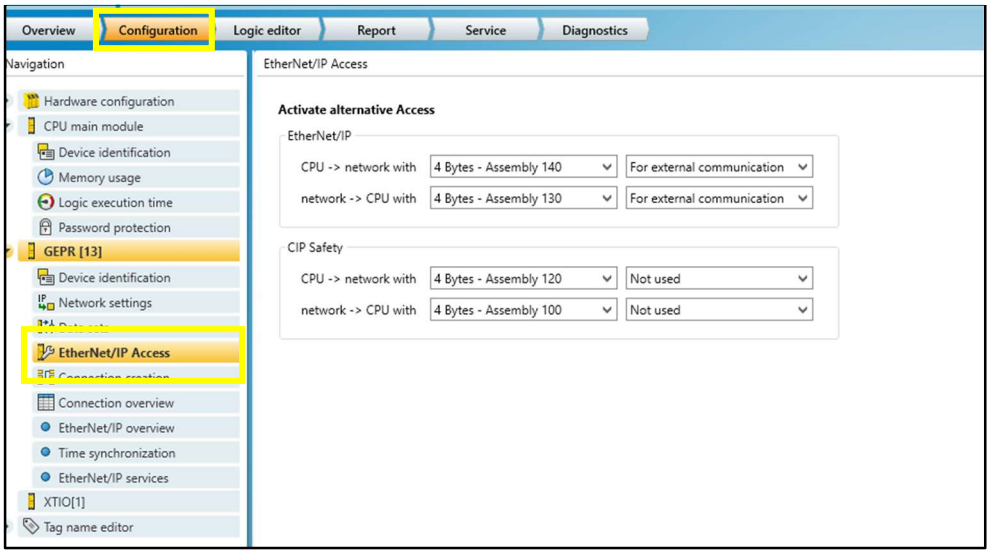


- Select CONFIGURATION -> GEPR[13] -> NETWORK SETTINGS
- Ensure the projected device and physical device have the same IP's. If not read or transfer to the device to match the IP.

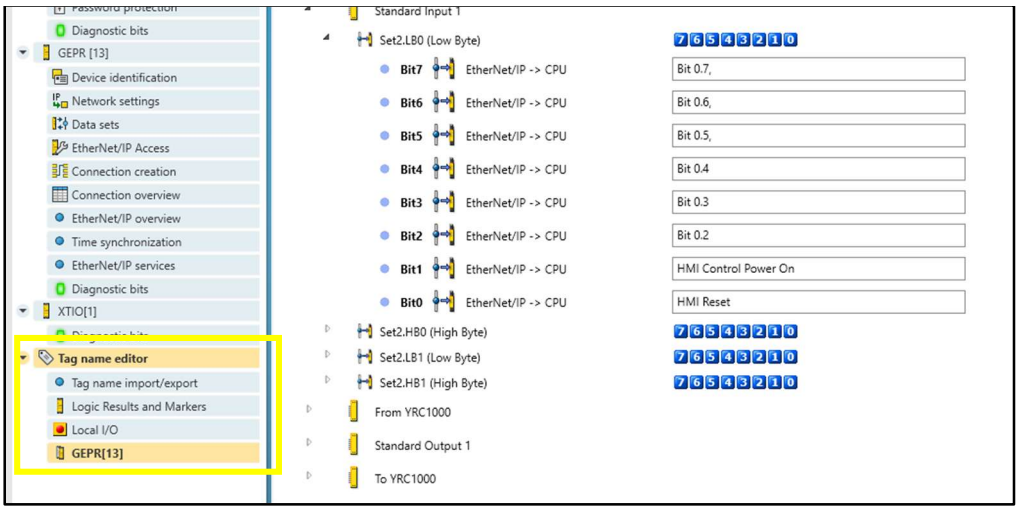


4 BYTE I/O CONNECTION (STANDARD I/O)

- Under CONFIGURATION -> GEPR[13] -> ETHERNET/IP ACCESS
- Select 4 bytes – Assembly 140 for CPU -> Network
- Select 4 Bytes – Assembly 130 network -> CPU
- Both should state “For external communication”

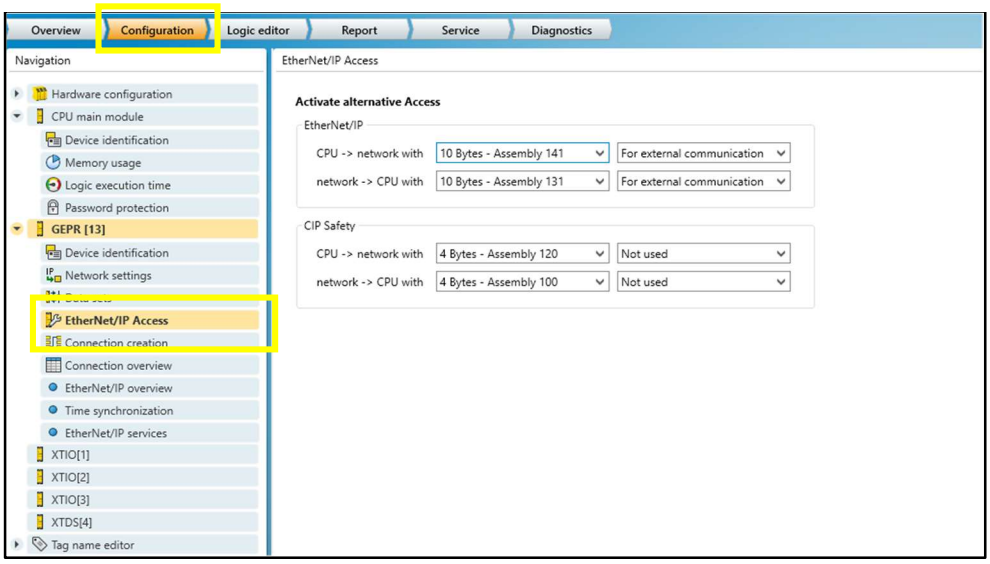


- Optional. Under CONFIGURATION -> TAG NAME EDITOR you can update the tags for the 4 bytes of standard EtherNet/IP data.

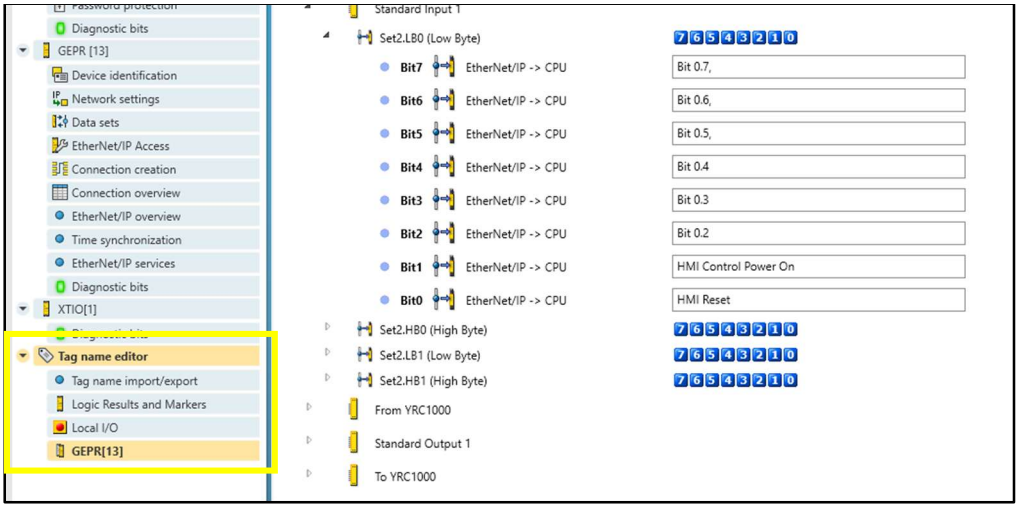


10 BYTE I/O CONNECTION (STANDARD I/O)

- Under CONFIGURATION -> GEPR[13] -> ETHERNET/IP ACCESS
- Select 10 bytes – Assembly 141 for CPU -> Network
- Select 10 Bytes – Assembly 131 network -> CPU
- Both should state “For external communication”

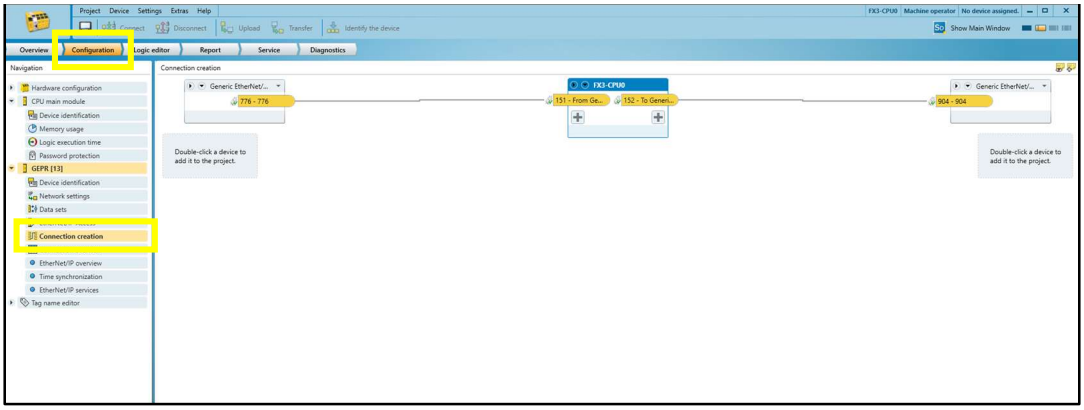


- Option. Under CONFIGURATION -> TAG NAME EDITOR you can update the tags for the 10 bytes of standard Ethernet/IP data.

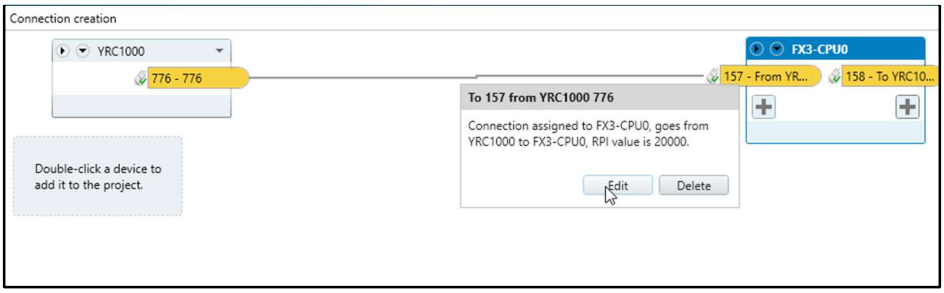


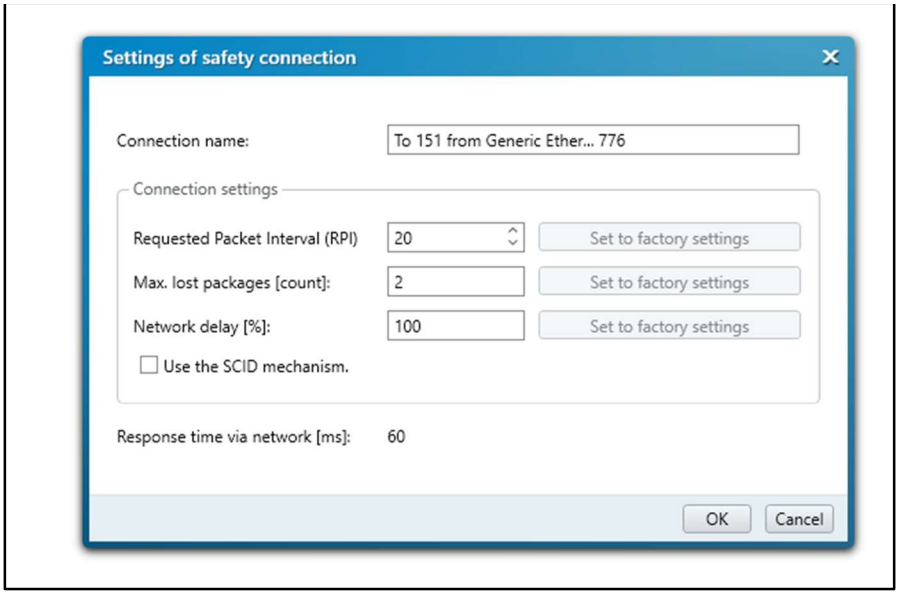
CONNECTION CREATION

- Under CONFIGURATION -> GEPR[13] -> CONNECTION CREATION your connection from the FX3 CPU and the Generic EtherNet/IP CIP Safety Module should already be connected.

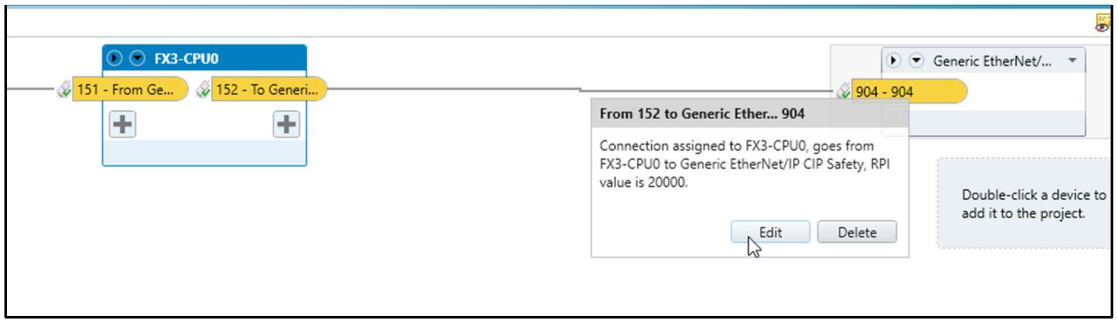


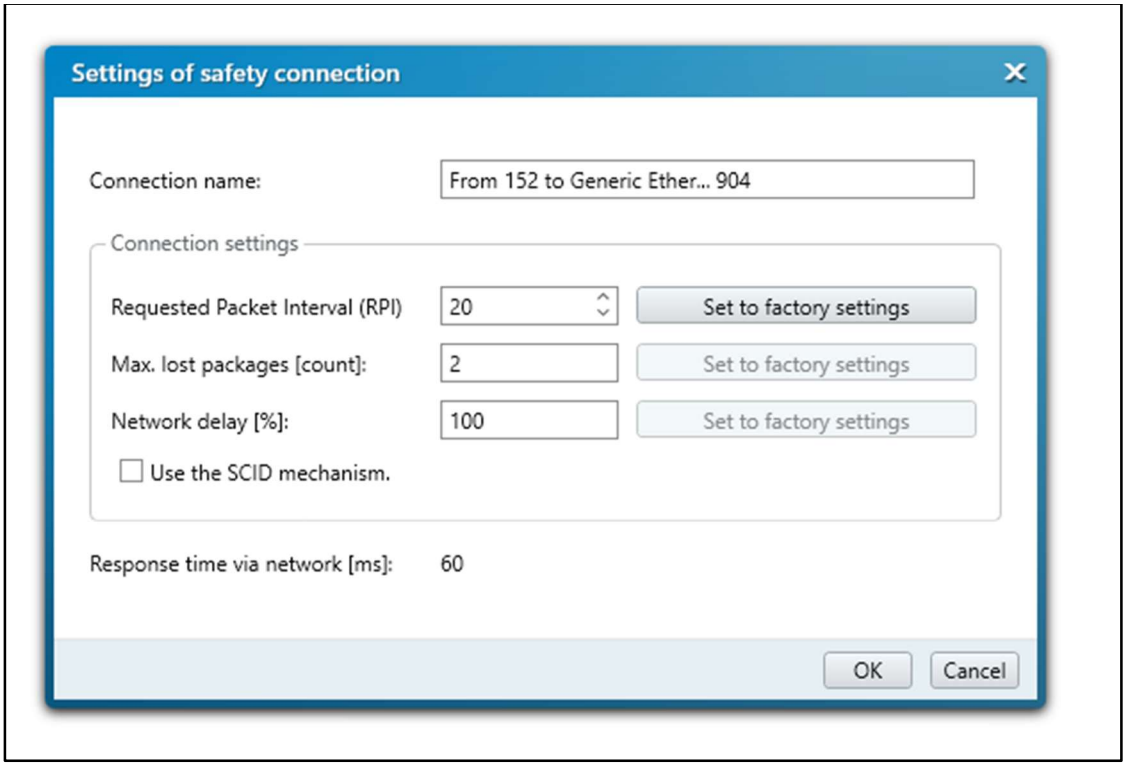
- Right click the connection wire between the Generic Device and the FX3 and press edit. Make sure you have the RPI set to 20 or whatever RPI is required for your application. Uncheck the “Use the SCID mechanism” button. The YRC1000 controller does not support this.





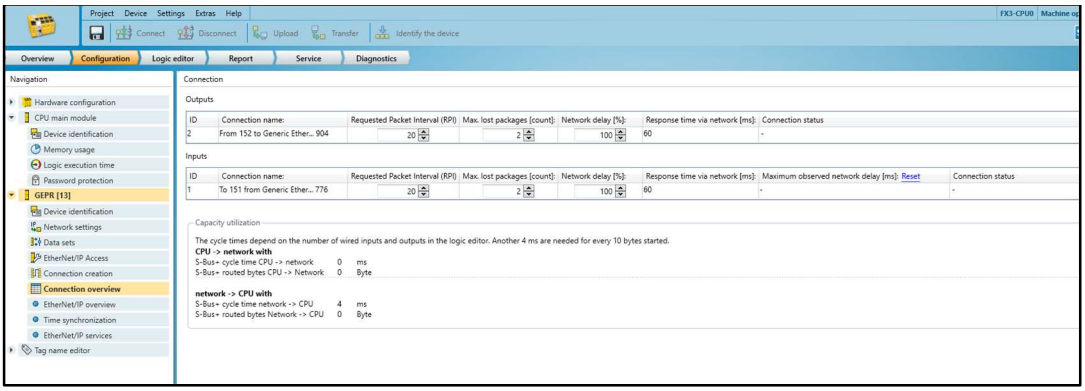
- Do the same thing for the output wire from the FX3 to the Generic Device. Right click the wire, press edit, change RPI and uncheck the SCID mechanism.





CONNECTION OVERVIEW

- Under CONFIGURATION -> GEPR[13] -> CONNECTION OVERVIEW you should be able to see the input and output connection from the FX3 CPU to the Generic EtherNet/IP CIP Safety Module.
- Confirm the RPI is what you want, otherwise you can also modify it here.



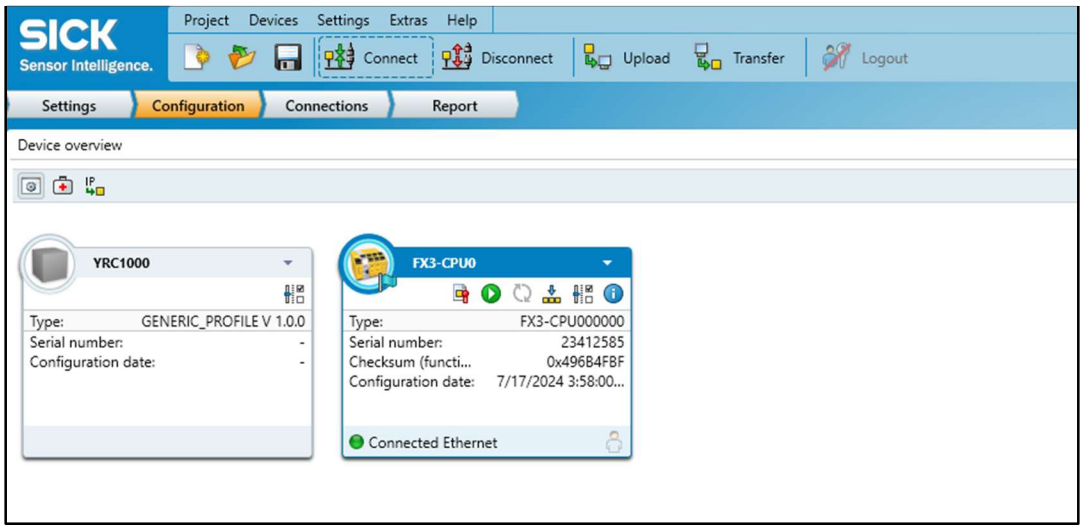
DEVICE ASSIGNMENT

Once you are ready to associate the real hardware with the configured hardware in the project, perform these actions below.

- On the main project window, press connect.
- Once you are connected to the FX3 CPU then it will show up on the right side of the page under found devices.



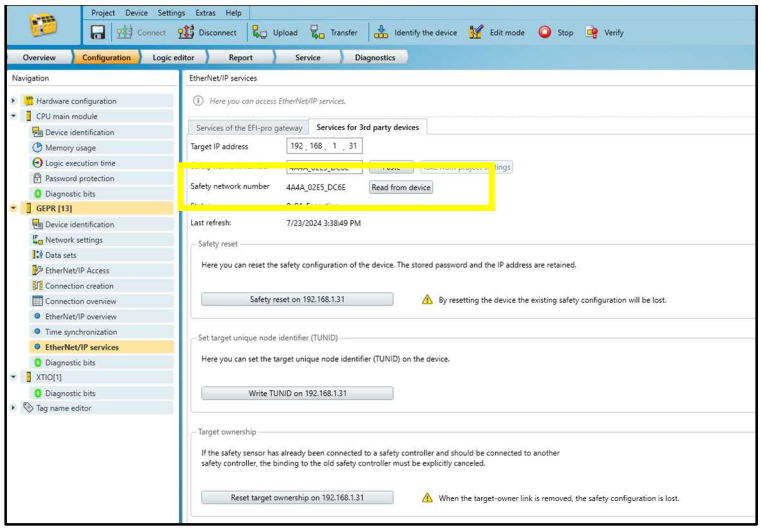
- Drag the real / online device over to the FX-CPU0 on the device overview of your project.
- This will assign the device to this configuration.
- It will automatically write the configuration to the CPU. It then should put you online with the CPU and it should look like below.
- If there is a mismatch it will ask you if you want to download or read the configuration.
- Make sure the hardware configuration is identical to what has been physically set up, then write/transfer the configuration.

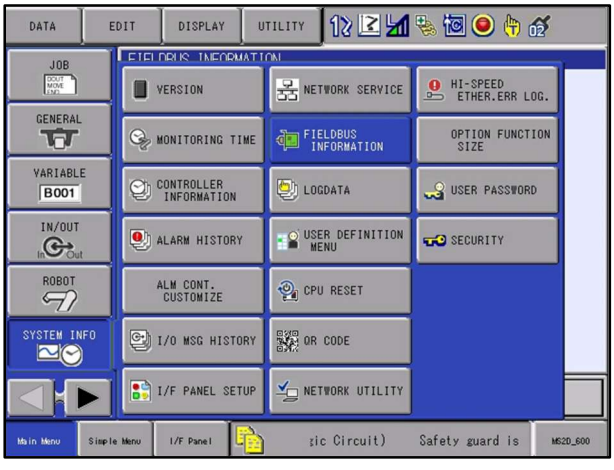


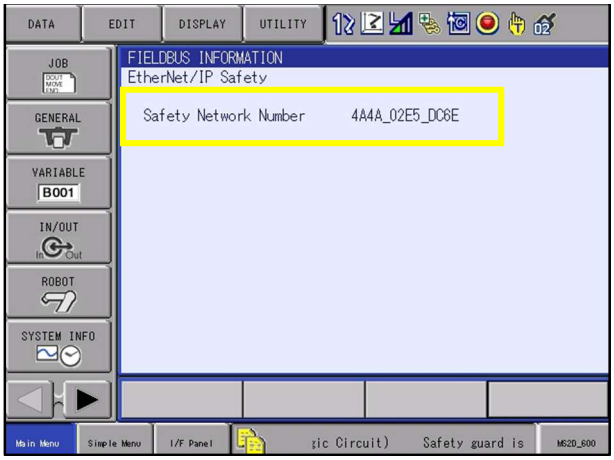
WRITE TUNID TO ROBOT CONTROLLER

Perform this step after setting up Ethernet/IP Safe on the robot controller.

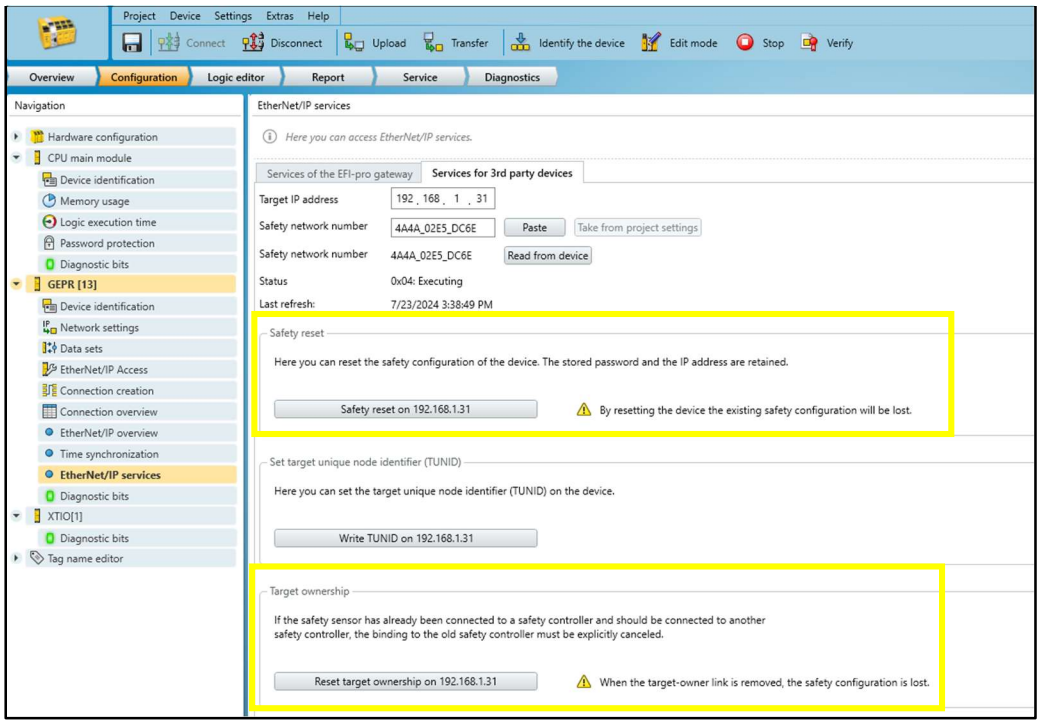
- Connect to the CPU.
- Select CONFIGURATION -> GEPR[13] -> ETHERNET/IP SERVICES
- Select the tab “SERVICES FOR 3rd PARTY DEVICES”
- Enter the IP of the robot, (192.168.1.31 in this example), then press the read from device button.
    - Status is 0x04: Executing then there is nothing to do and the SNN is correct.
    - Status is 0x08: Waiting for target unique node identifier(TUNID)
        - Press take from project settings to get the SNN.
        - Click on write TUNID on 192.168.1.31 button.
        - This will set the TUNID to match the project and you should see on the teach pendant under SYSTEM INFO -> FIELDBUS INFORMATION that the SNN is no longer FFFF_FFFF_FFFF and should match the program SNN. As you can see from the images below the SNN on the robot matches the number in Safety Designer.







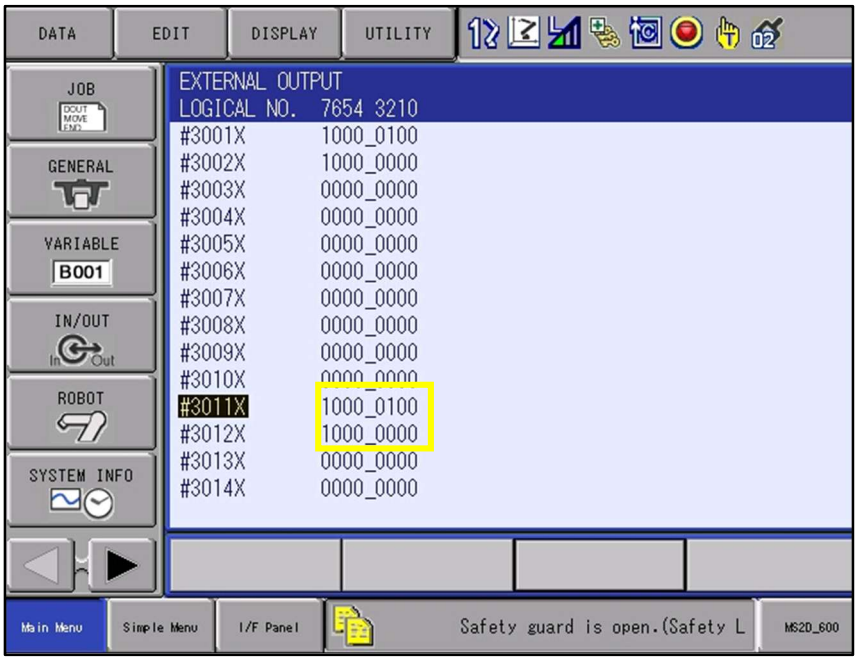
- If the TUNID was set before by some other safety device and is different than the one in the project, you will need to reset the safety configuration and the target ownership.
- Both can also be done on the Services for 3rd party devices page.



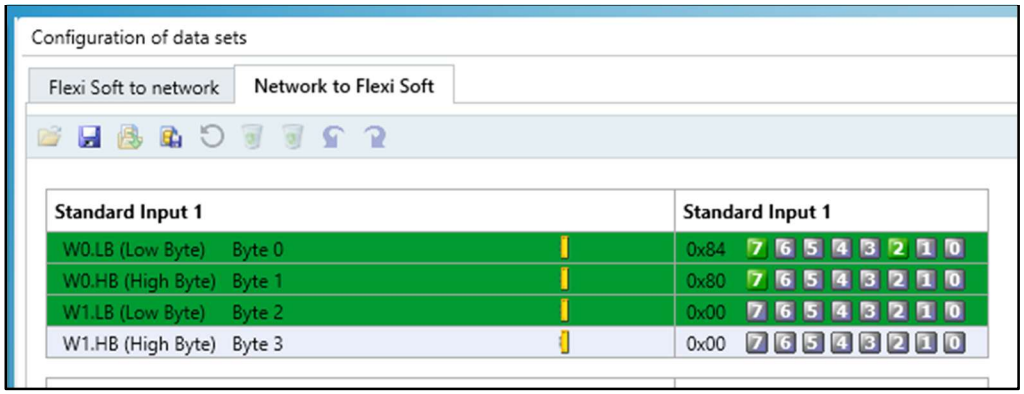
TESTING

To test / debug the Ethernet/IP standard I/O connection, you will need to know exactly where the I/O has been allocated. The I/O ranges in this example will not necessarily line up with the hardware configuration you currently have. The photo below shows 3 bits enabled. 30112, 30117, 30127.

STANDARD I/O NETWORK TO FLEXI SOFT

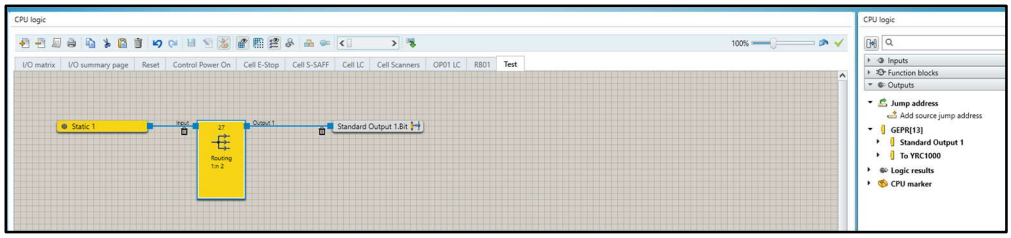


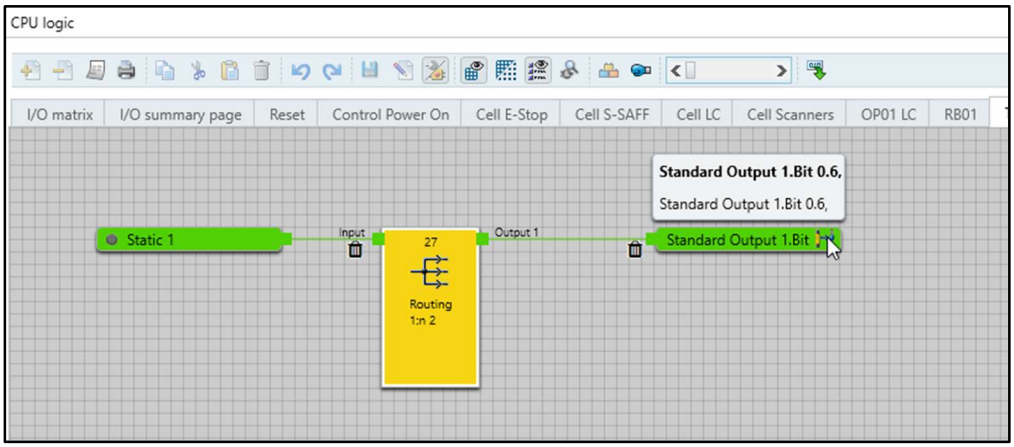
- On the Sick Safety Designer software, under CONFIGURATION -> GEPR[13] -> DATA SETS click on Network to Flexi Soft tab.
- As you can see from the screenshot there are 3 bits turned on. These correlate to the bits that were turned on in the robot controller.



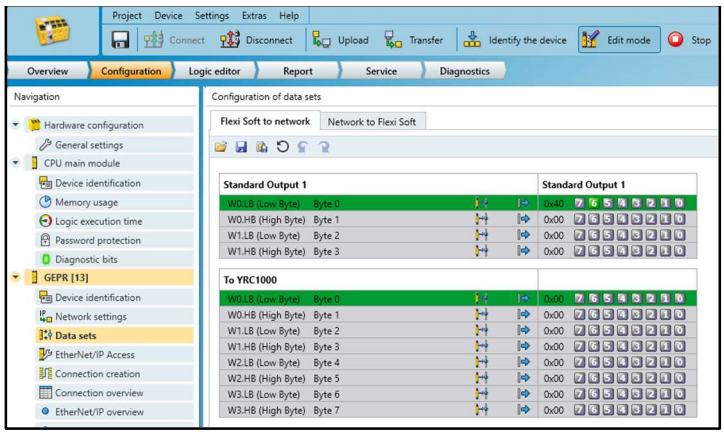
STANDARD I/O FLEXI SOFT TO NETWORK

- Now we will check Sick standard outputs (robot inputs).
- Go to the Logic Editor tab, click Edit Mode, create a new page, drag a static 1 input to a Routing 1:n function block.
- Under outputs under CPU Logic on the right side of the screen you will see the GEPR with standard and Safety Outputs.
- Drag a standard output to the output of the Routing function block. In this case Byte 0 Bit 6 was used. Transfer the program to the PLC.

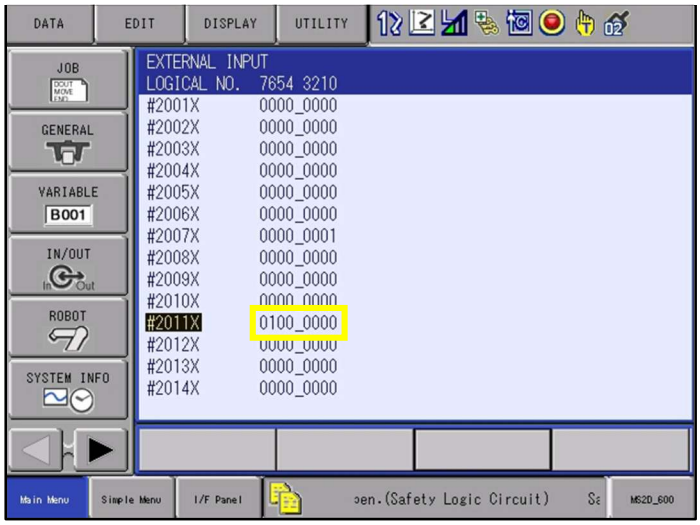




- Under CONFIGURATION -> GEPR[13] -> DATA SETS, click Flexi Soft to network. You should see in the standard output that byte 0 bit 6 is on like the image below.

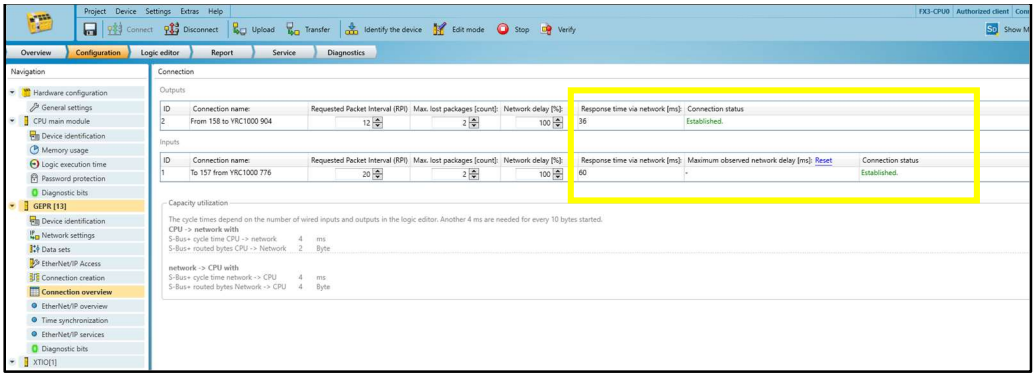


- On the teach pendant under IN/OUT -> EXTERNAL INPUTS you will see external input #20116 is on.

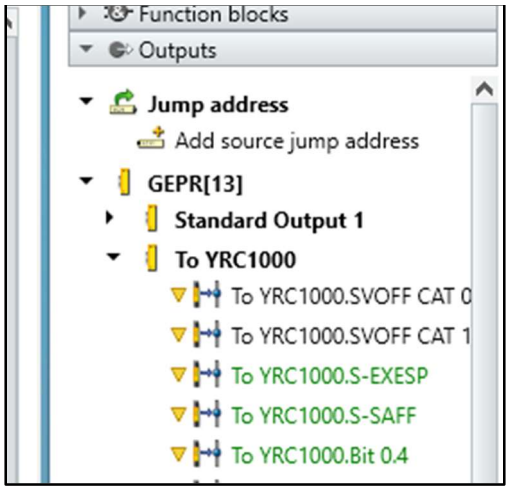


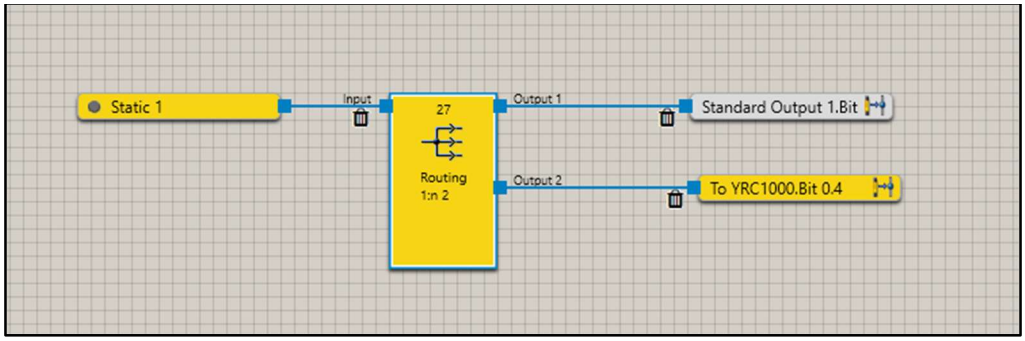
SAFETY I/O FLEXI SOFT TO NETWORK

- To verify the safety communication there are a couple of things we could check for.
- On the Safety Designer program under CONFIGURATION -> GEPR[13] -> CONNECTION OVERVIEW you can see the connection status of the safety signals to the robot.
- If both the inputs and outputs have “Established” under the Connection status tab then they are configured correctly and are working as expected.

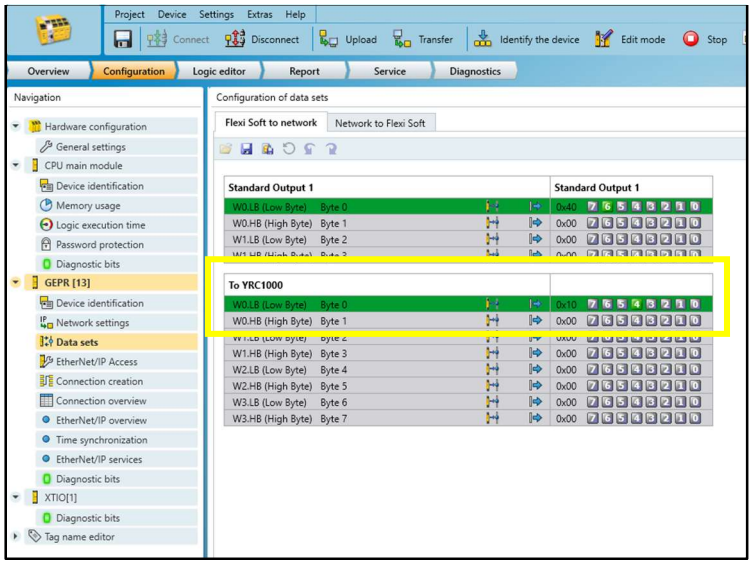


- Another way to confirm communication would be to modify the logic we previously made to include a safety signal. Go into Edit mode, double click the Routing 1:n block and add a second output.
- Under CPU LOGIC -> GEPR[13] -> To YRC1000. Byte 0 Bit 4 was used in this example.
- Transfer the new configuration to the controller.





- If you go back to the CONFIGURATION -> GEPR[13] -> DATA SETS page under Flexi Soft to network tab you will see Byte 0 Bit 4 on.

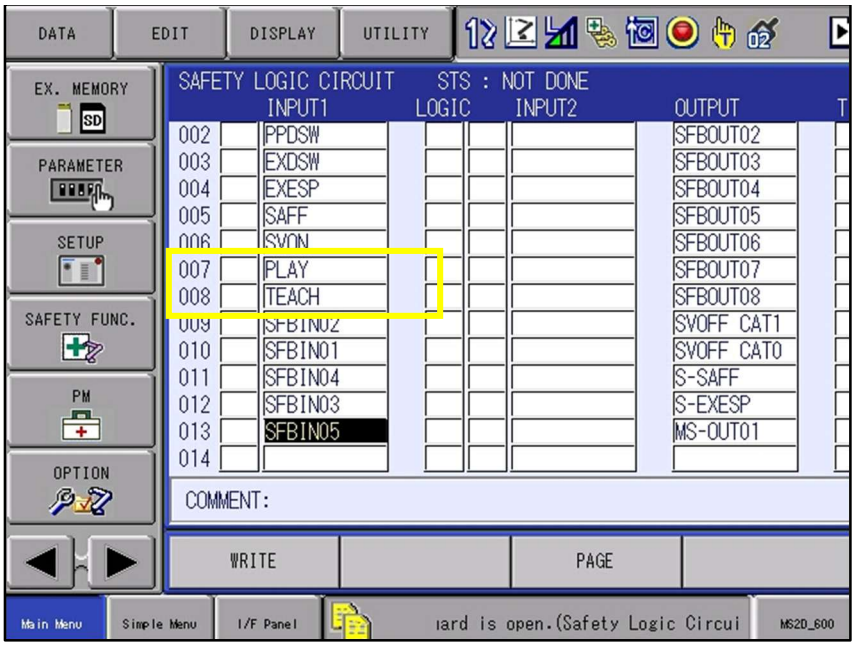


- On the robot teach pendant under SAFETY MENU -> SLC SIGNAL DISPLAY you can see the status of all safety inputs.

SAFETY I/O NETWORK TO FLEXI SOFT

This document assumes that the robot's safety logic circuit is using the standard mapping provided by Yaskawa America / Yaskawa Canada.

- To view the Ethernet/IP safety I/O mapping, select SAFETY -> SAFETY LOGIC CIRCUIT
- The default mapping is already "sending" basic signals such as teach mode and play mode status



- Looking at the Sick Safety Designer software, under CONFIGURATION -> GEPR[13] -> DATA SETS
- Toggle the teach pendant key switch between teach and play. You should be able to see the corresponding status on the Sick Safety Designer screens.

